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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
COOK, JONATHON	

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2886	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/576,069	PODOLEANU, ADRIAN	
	Examiner	Art Unit	
	JONATHON D. COOK	2886	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 April 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-58,82-86 and 90-100* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *53-58,82-86 and 90-92* is/are allowed.

6)☒ Claim(s) *1-46,52 and 93-100* is/are rejected.

7)☒ Claim(s) *47-51* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/29/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

Response to Arguments

Applicant's arguments filed 4/29/2010 have been fully considered but they are not persuasive.

The first argument applicant presents is that the allowable subject matter in claim 53 appears in all the independent claims. However, first examiner would note that none of the claims 53-92, which are all method claims, were rejected under the prior art. Further, the examiner notes that the rest of the claims that were rejected under the prior art are apparatus claims and the allowable subject matter of claim 53, "*displacing the reference and object beams laterally and projecting them onto different portions of the optical spectrum dispersing means,*" is a functional limitation which carries no weight in an apparatus claim. The structures shown are capable of performing this function thus those claims are rejected by the art still.

Applicant argues that “the relatively displaced reference beam and the relatively displaced object beam are superposed on the reading element" is not a limitation shown by de Boer. However, first the examiner notes this is functional language which again carries no patentable weight beyond the structure having to be capable of performing the function, and it is. Second the examiner notes that saying that the apparatus of the instant application is different considerably from the apparatus of de Boer if the examiner has shown how the claims are similar and the applicant has not adequately disproved that.

Applicant argues that the "displacing means" of de Boer, a translation stage (270), is not the displacing means recited in claim 1. However, the applicant argues that the displacing means in the instant application is not the same and sights pieces of the specification.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the displacing means) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

The applicant argues that the intrinsic optical delay of de Boer is different from the intrinsic optical delay of the instant application but the examiner sees no structural differences in what is claimed from what is shown. The definition of intrinsic, belonging to a thing by its very nature, is not in of itself enough to define structure per se and thus the wherein clause is functional language in any case and does not define around the art.

Applicant argues that the instant invention does diffraction first and interference second and de Boer does interference first and diffraction second, again this is not shown in the claims and the applicant is merely arguing things shown in the specification.

The applicant argues further about the differences of the applicant's invention as compared to the one of de Boer but merely draws more subject matter from the

specification to support his argument. The examiner respectfully reminds the applicant that the structure claimed must be what is considered and not the structure disclosed in the specification. Thus the applicant's argument that de Boer does not show two separated beams, there's no gap as the specification defines it, or the definition the applicant attributes to "intrinsic optical delay" are all moot.

112 6th Paragraph

The "means" statements that appear in the apparatus claims fail to invoke the proper 112 6th Paragraph format. Therefore, the examiner will not be construing them to be "means for" with all the limitations of structure that are brought in with them. Thus the functional language included in the apparatus claims will be without supporting structure and carry very little weight.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-10, 12, 13, 16-25, 29, 31, 32, 34-39, & 94-100 are rejected under 35 U.S.C. 102(e) as being anticipated by **de Boer et al** (PGPub 2005/0018201) (de Boer).

Regarding **Claims 1, 4-7, 9, 16, 17, 19-21, 23-25, 29, 32, 36-39, & 94-100** , de Boer discloses and shows in **fig. 3** an apparatus and method for Spectral Domain optical coherence tomography, comprising:

a sample arm (**208**) (applicant's object optics) arranged to transfer a beam from the light source (**202**) (applicant's low coherence optical source) to a tissue sample (**130**) (applicant's target object) to produce an object beam, The object objects clearly showing a first zoom element (the lens shown focusing the beam and is also applicant's focusing element) capable of altering the diameter of the object beam;

a reference arm (**206**) (applicant's reference optics) arranged to produce a reference beam;

a mechanism (**270**) (applicant's displacing means and means to alter the optical path difference) comprising at least two reflective elements capable of displacing at least one of the object beam and the reference beam to step the reference arm (**206**) length over a distance (applicant's relatively displaced object beam and relatively displaced reference beam) and where the mechanism (**270**) can utilize stretching an optical fiber (applicant's displacing means arranged to move the relative positions of the object fiber and reference fiber ends), free space translational scanning using a piezoelectric transducer (reflection)(utilizing applicant's adjustable gap), or via a grating based pulse shaping optical delay line (diffraction) to create the displacement (**Paragraphs 81 & 89**). Further, the displacing means is capable of relatively orientating the displaced object beam and reference beam in a displacement plane and capable of adjustment until the object and reference beams are parallel in the plane;

a diffraction grating **(212)** (applicant's optical spectrum dispersing means) capable of receiving the two relatively displaced beams on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means and to disperse their spectral content onto a detector array (**216**) (applicant's reading element which is a photodetector array) and grating lines of the diffraction grating are perpendicular to a line connecting the center of the relatively displaced reference and object beams;

the stepping of the reference beam will create a phase delay (applicant's intrinsic optical delay) between the two wavefronts (applicant's wavetrains) of the object beam and reference beam and these combined beams are then spectrally dispersed by the grating (**212**) to create a channeled spectrum of the optical path difference in the interferometer on the reading element;

wherein as can be clearly seen in the **fig. 3** the reference and sample arm include fiber optics to transmit the reference and sample beam. Thus making this a hybrid interferometer.

Further, where functional language appearing the above claims the examiner finds the relevant means capable of performing those functions.

Regarding **Claim 2**, de Boer discloses the mechanism (**270**) may involve free space translational scanning using a piezoelectric transducer (**Paragraph 89**). This would involve scanning a mirror (applicant's another of a least two reflective elements) in the reference arm and reflecting the object beam off the sample (applicant's one of at least two reflective elements).

Regarding **Claim 3**, de Boer discloses the aforementioned and further shows in **fig. 3** the reference beam being transferred from a lens (not labeled) to a reflecting mirror which may be modulated by a piezoelectric transducer. This arrangement meets the limitation of the displacing means comprises an optic-optic modulator.

Regarding **Claims 8 &13**, de Boer discloses and shows in **fig. 3** the aforementioned further, after the reference arm (**206**) is clearly shown a collimating lens as part of the displacing means, thus is met the limitation of altering the diameters of at least one of the object beam and reference beam.

Regarding **Claim 10**, de Boer further discloses that the reference arm optionally has a phase modulator mechanism or the like (applicant's means arranged to control the intrinsic optical delay) (**Paragraph 89**).

Regarding **Claim 12**, de Boer discloses the aforementioned further the detector (**216**) provides a signal to the processor (**218**) (applicant's signal analyzer) which is capable of determining the distribution of the reflections or scattering points in a depth range within the target object.

Regarding **Claim 18**, de Boer discloses the aforementioned and further the displacement means is capable of permitting an adjustable lateral superposition of the two relatively displaced beams in the displacement plane onto the optical spectrum dispersing means.

Regarding **Claim 22**, de Boer discloses that instead of a grating a prism may be used as a dispersing element (**Paragraph 107**). This prism will have an entrance surface and is capable of being orientated such as the limitation recites;

Regarding **Claim 31**, de Boer discloses the aforementioned and further while there is no explicit disclosure to where the interference occurs it would occur partially on the dispersing means and reading element.

Regarding **Claims 34 & 35**, de Boer discloses using a scanning mirror (applicant's scanning element) to alter the position of the focused beam on the sample (Paragraph 86) and is capable of performing any of the mention scanning types.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

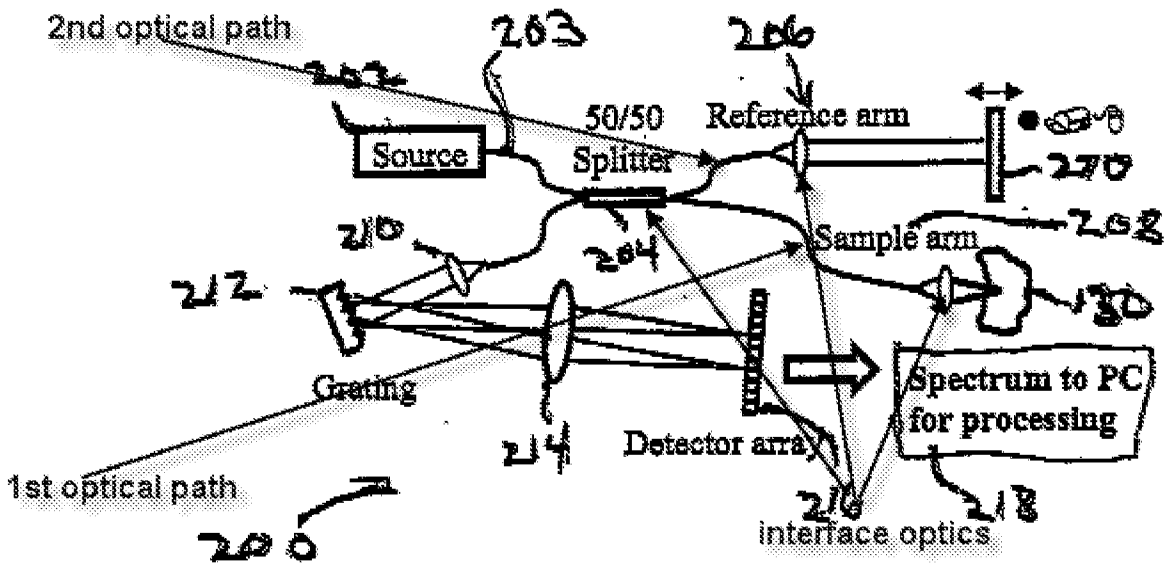
4. Claim 11, 14, 26-28, 30, 33, 40-46, 52, & 93, are rejected under 35 U.S.C. 103(a) as being unpatentable over **de Boer**.

Regarding **Claims 11, 33, & 93**, de Boer discloses the aforementioned. Further, a first optical path and second optical path and interface optics are shown (see modified figure 3);

de Boer fails to show a third optical path where the optical output beam from the object are transferred to the displacing means and a processing means to control the optical path difference ;

However, de Boers does disclose optionally using phase modulators such as acousto-optic, electro-optic, or the like. These would lend themselves to having both the reference and object beam displaced which is an obvious modification that the examiner takes official notice is well known to one of ordinary skill in the art.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have a third optical path where the optical output beam from the object is transferred to the displacing means because displacing both the reference and object beam allow for faster stepping of the phase shift between the two and allow for more depth in scanning in an OCT apparatus.



(modified figure 3)

de Boer still fails to show a processing means to control the optical path difference;

However, the examiner takes official notice that this is well known and obvious to one of ordinary skill in the art;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have a processing means to control the optical path difference because in order for interference to occur the optical path difference must lie within the coherence length of the light thus a processor would allow for fine tuning of that difference and lead to faster scanning and better image quality.

Regarding **Claim 14**, de Boer discloses the aforementioned but fails to disclose a means to match polarization of the relatively displaced object beam and reference beam with that of the dispersing means;

However, the examiner takes official notice that it would be obvious to one of ordinary skill in the art to include such a means;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have a means to match polarization of the relatively displaced object beam and reference beam with that of the dispersing means because often with dispersing means when the polarization of the incoming light does not match the light is aberrantly diffracted which can cause noise in the system and thus degrade the quality of the measurements.

Regarding **Claims 26-28**, de Boer discloses the aforementioned but fails to explicitly disclose multiple zoom elements (2^{nd}-4^{th});

However, the examiner takes official notice that it would be obvious to one of ordinary skill in the art to use as many zoom elements as needed;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to provide a 2^{nd}-4^{th} zoom elements because it is common sense to use any number of such lenses in an optical device depending on the needs of the apparatus and the inclusion of such would produce no unexpected results.

Regarding **Claim 30**, de Boer discloses the aforementioned but fails to disclose the interference takes place entirely on the reading element;

However, where the interference takes place is merely an adjustment of the optics and obvious to one of ordinary skill in the art;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have the interference takes place entirely on the reading element

because it is common sense to adjust where the interference occurs depending on the needs of the apparatus.

Regarding **Claims 40-45**, de Boer discloses the aforementioned but does not disclose a second object beam, second reference beam, second displacing means, second dispersing means, second reading element, a second signal analyzer, or a first or second frequency to amplitude converter;

However, for the second object beam, second reference beam, second displacing means, second dispersing means, second reading element, a second signal analyzer this is merely a duplication of parts which is obvious to one of ordinary skill in the art;

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify de Boer with second object beam, second reference beam, second displacing means, second dispersing means, second reading element, a second signal analyzer, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

Regarding **Claim 46**, de Boer fails to disclose a frequency to amplitude converter, or a second frequency to amplitude converter;

However, the examiner takes official notice that frequency to amplitude conversion is well known to one of ordinary skill in the art;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify it with a frequency to amplitude converter because the

converter can avoid the heavy processing load to deducing a peak or average frequency from the spectrum;

Regarding **Claim 52**, de Boer discloses the aforementioned but does not explicitly disclose the low coherence source is a laser driven below threshold;

However, the examiner takes official notice that this is a well known source for low-coherence light;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify it with a laser driven below threshold because this is a known means of producing low-coherence light which is easily and relatively cheaply implemented which would produce no unexpected results.

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over **de Boer** in view of applicant's admitted prior art (AAPA);

Regarding **Claim 15**, de Boer discloses the aforementioned but fails to disclose a means to compensate for dispersion in the interferometer;

However, AAPA teaches using a galvanometer mirror behind a diffraction grating or prism, which operates on the basis of transforming a linear phase in optical frequency in a temporal delay based on principles developed initially for processing of femtosecond laser pulses (**Page 43, 1st full paragraph of the specification)**;

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify it with means to compensate for dispersion in the interferometer because it compensates for dispersion in the interferometer which causes noise in the measurements.

Allowable Subject Matter

Claims 53-58, 82-86, & 90-92 are allowed.

Claim 47-51 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

As to Claim 47, the prior art of record, taken alone or in combination, fails to disclose or render obvious the third beam splitting means, third displacing means, third optical spectrum dispersing means and third reading element, in combination with the rest of the limitations of the claim.

As to Claim 49, the prior art of record, taken alone or in combination, fails to disclose or render obvious. the optical duplicating element, in combination with the rest of the limitations of the claim.

48, 50, & 51 are allowable because they depend on the above independent claims.

As to Claims 53, 54, 55, & 57, the prior art of record, taken alone or in combination, fails to disclose or render obvious displacing the reference and object beams laterally and projecting them onto different portions of the optical spectrum dispersing means, in combination with the rest of the limitations of the claim.

56, 58, 82-86, & 90-92 are allowed by virtue of their dependency on the above independent claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHON D. COOK whose telephone number is (571)270-1323. The examiner can normally be reached on Mon-Fri 11:00am to 7:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tarifur Chowdhury can be reached on (571)272-2287. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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May 10th, 2010

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